US009141839B2

(12) United States Patent
Xian et al.

(10) **Patent No.: US 9,141,839 B2**
(45) **Date of Patent: Sep. 22, 2015**

(54) **SYSTEM AND METHOD FOR READING CODE SYMBOLS AT LONG RANGE USING SOURCE POWER CONTROL**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **13/912,702**

(22) Filed: **Jun. 7, 2013**

(65) **Prior Publication Data**

US 2014/0361082 A1 Dec. 11, 2014

(51) **Int. Cl.**
G06K 7/10 (2006.01)

(52) **U.S. Cl.**
CPC ***G06K 7/10821*** (2013.01)

(58) **Field of Classification Search**
USPC 235/454, 455, 462.06
See application file for complete search history.

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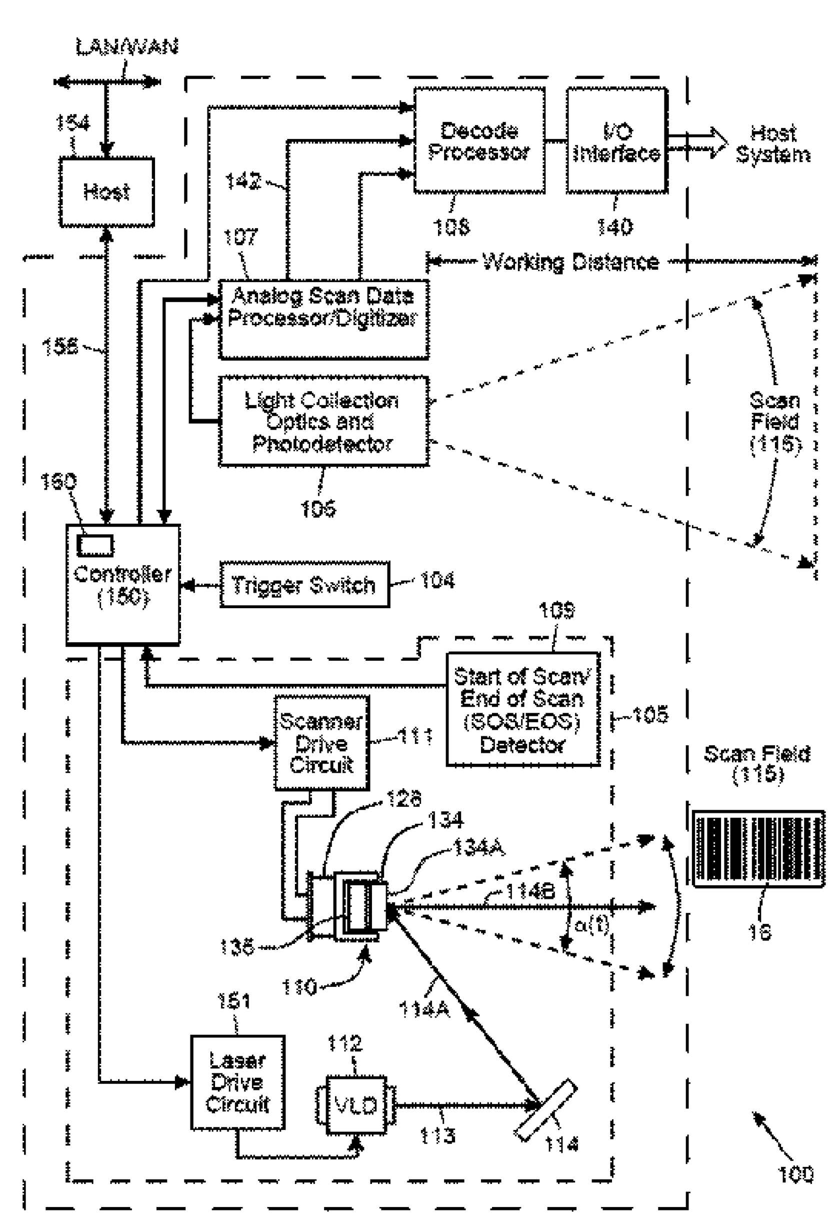
(57) **ABSTRACT**

A system and method are presented for improving the performance of code scanners in the extended and far ranges. At these distances, the intensity of the laser beam reflected off the code symbol can be markedly decreased, thereby decreasing the likelihood of a successful reading of the code symbol by the code scanner. The system provides for dynamic power increases to the laser source to generate a greater dynamic range.

19 Claims, 4 Drawing Sheets



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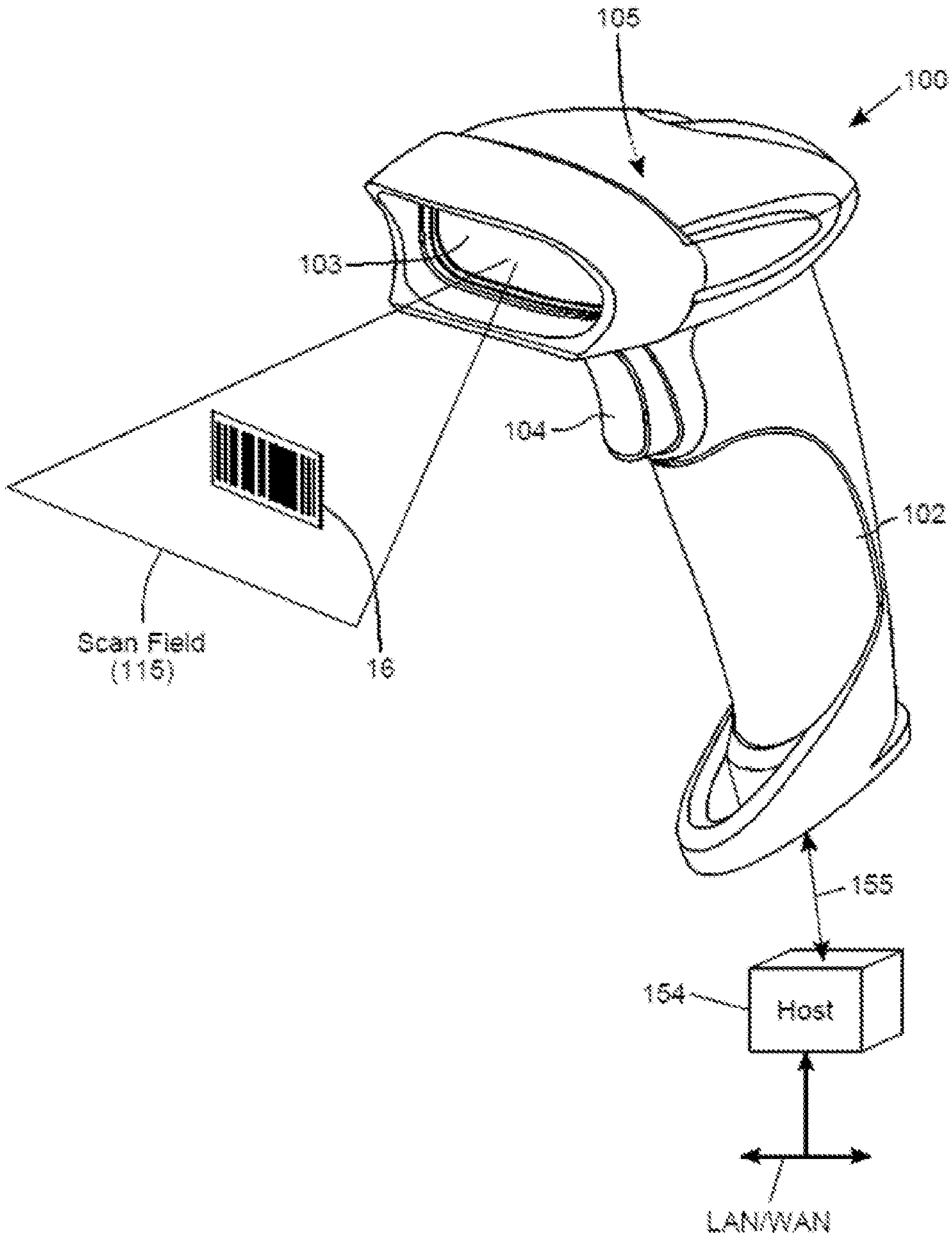
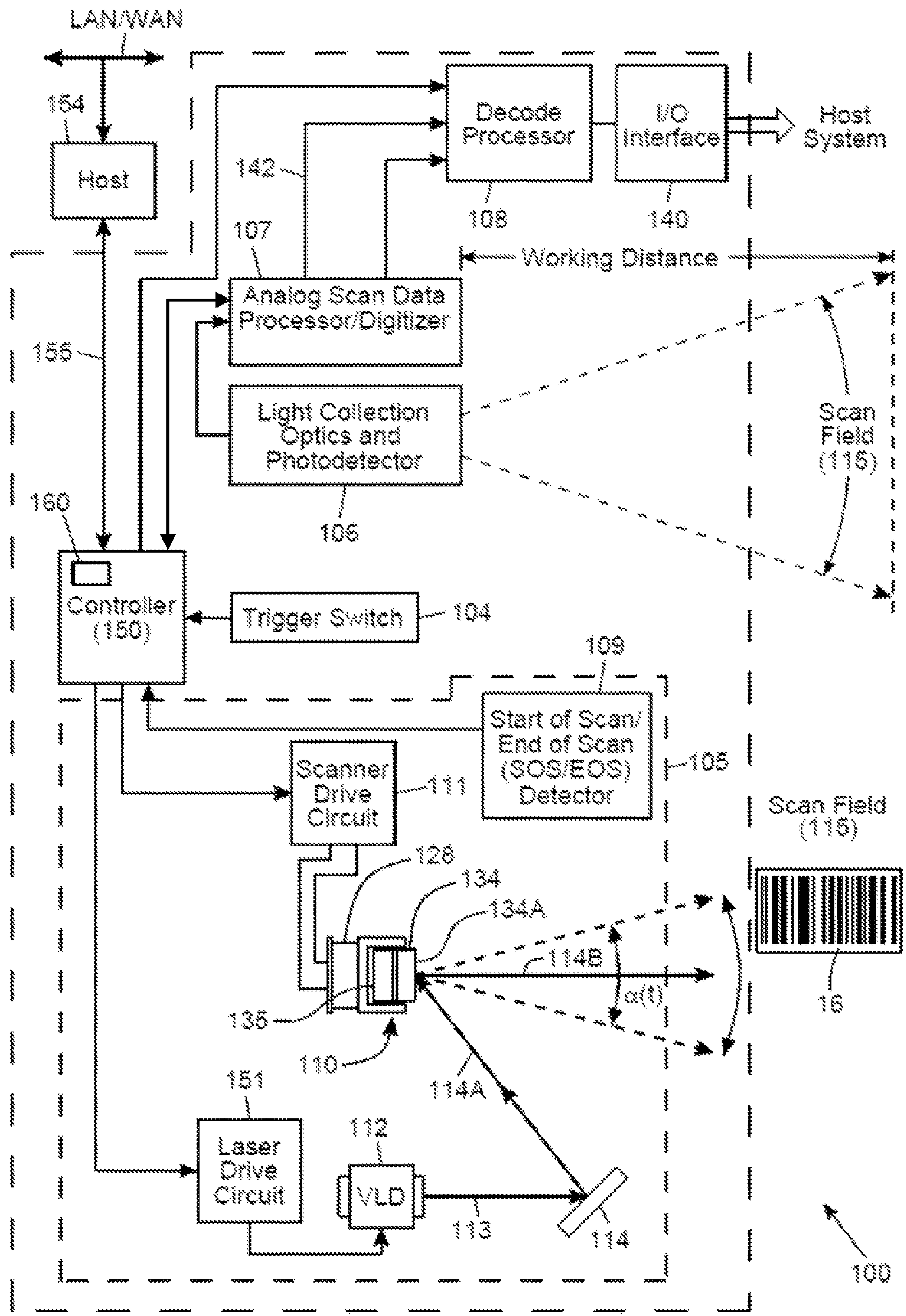
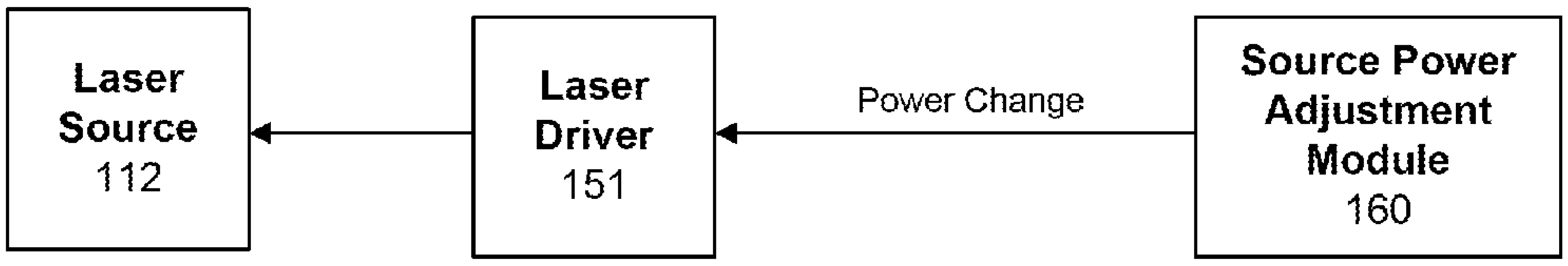


FIG. 1



LAN/WAN
154
Host
155
142
Decode Processor
I/O Interface
Host System
108
140
107
Working Distance
Analog Scan Data Processor/Digitizer
Light Collection Optics and Photodetector
Scan Field (115)
106
160
Controller (150)
Trigger Switch
104
109
Start of Scan/ End of Scan (SOS/EOS) Detector
105
Scanner Drive Circuit
111
Scan Field (115)
128
134
134A
114B
$\alpha(t)$
16
135
110
114A
151
Laser Drive Circuit
112
VLD
113
114
100

Fig. 2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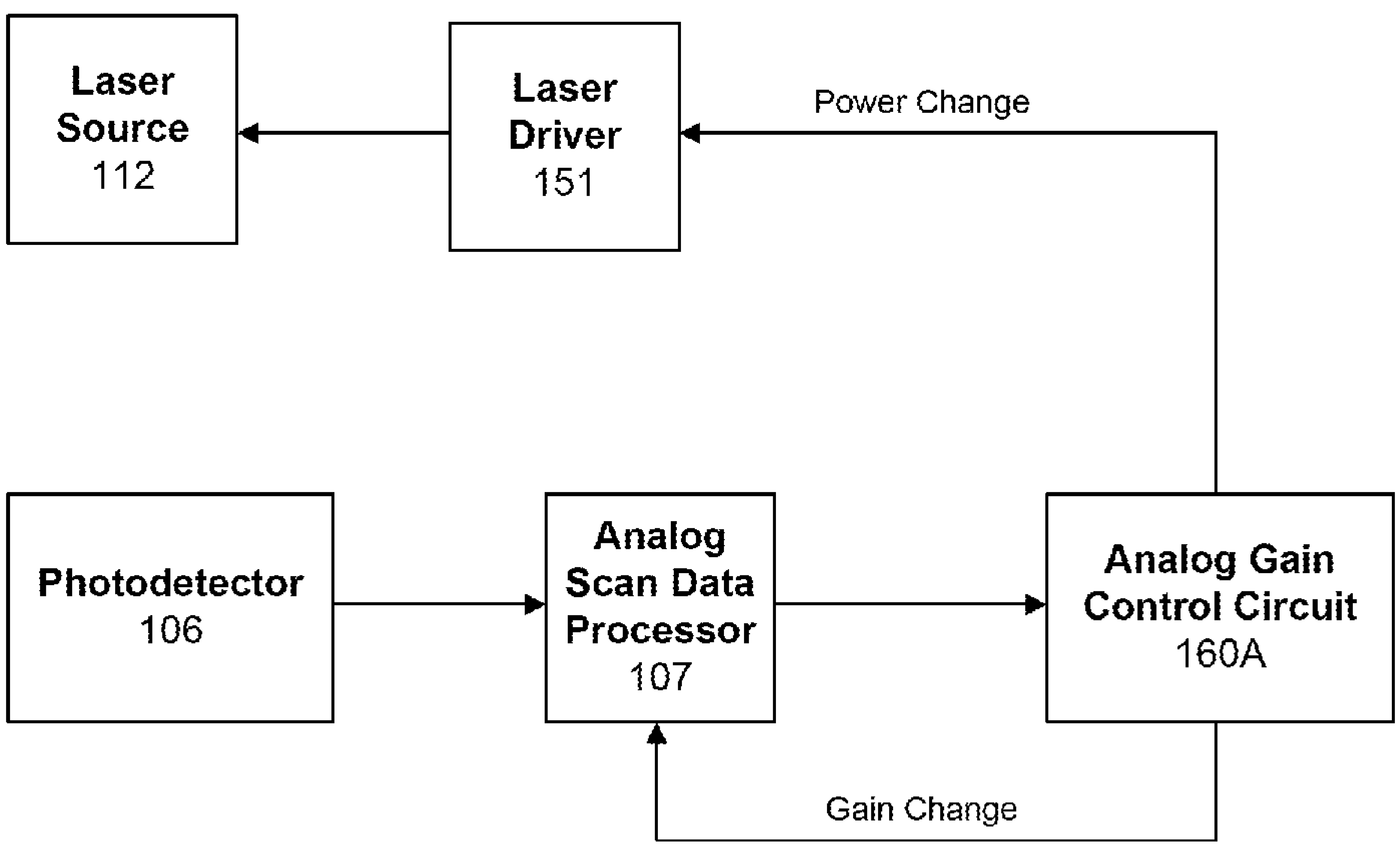
Laser
Driver
151
Power Change
Source Power
Adjustment
Module
160

FIG. 3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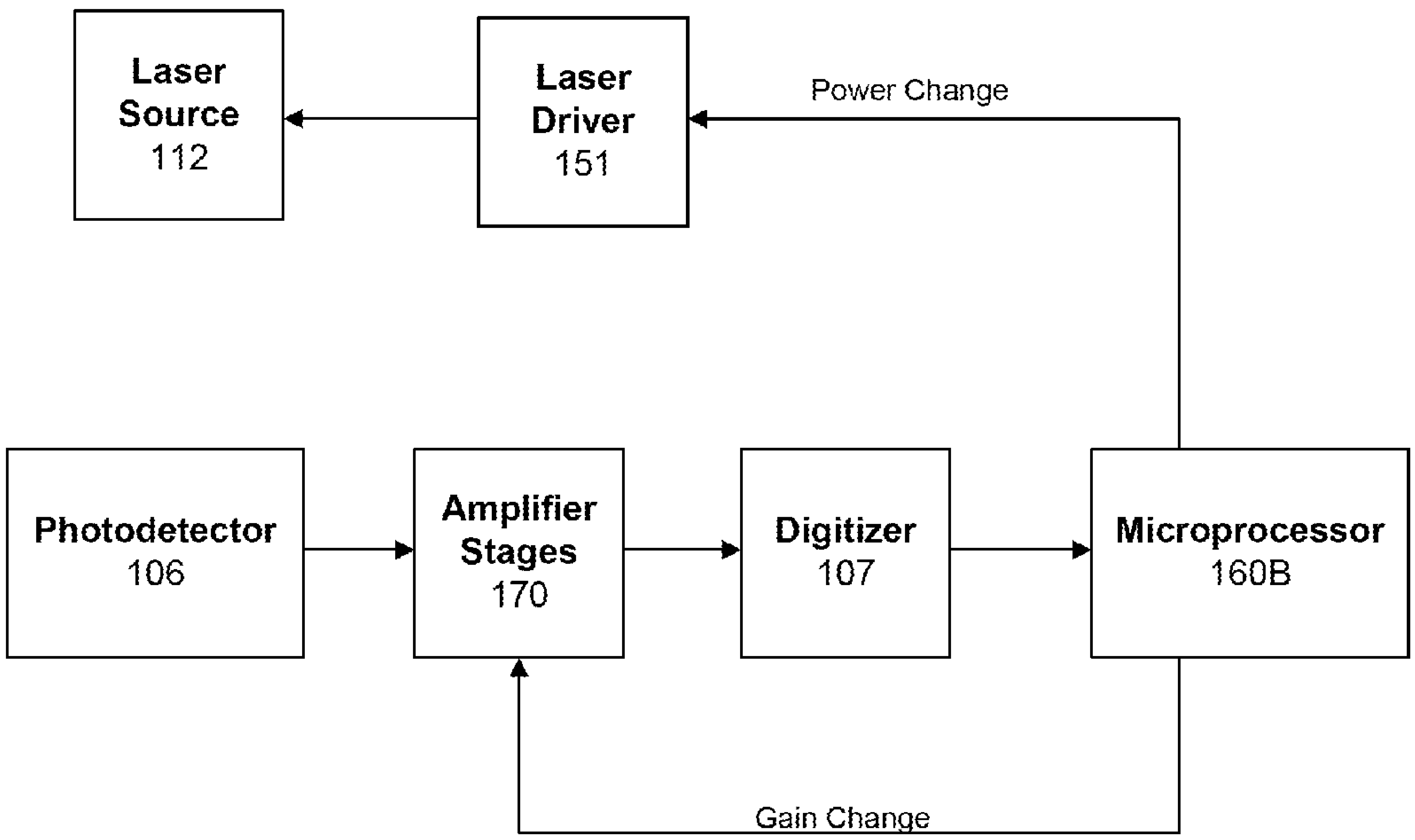
Source
112
Laser
Driver
151
Power Change
Photodetector
106
Analog
Scan Data
Processor
107
Analog Gain
Control Circuit
160A
Gain Change

FIG. 4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Laser Driver 151
Power Change
Photodetector 106
Amplifier Stages 170
Digitizer 107
Microprocessor 160B
Gain Change

FIG. 5

SYSTEM AND METHOD FOR READING CODE SYMBOLS AT LONG RANGE USING SOURCE POWER CONTROL

FIELD OF THE INVENTION

The disclosure relates generally to improvements in reading code symbols, and more particularly, to a system and method for reading code symbols at long range using source power control.

BACKGROUND OF THE DISCLOSURE

A code symbol reading device (e.g., barcode scanner, barcode reader, RFID reader) is a specialized input device for certain data systems commonly used by retailers, industrial businesses, and other businesses having a need to manage large amounts of inventory. Code symbol reading devices are often employed to read barcodes. A barcode is a machine-readable representation of information in a graphic format. The most familiar of these graphic symbols is a series of parallel bars and spaces of varying widths, which format gave rise to the term "barcode." The adoption of the Universal Product Code (UPC) version of barcode technology 1973 quickly led to a revolution in logistics by obviating the need for manual retry of long number strings.

Most barcode scanners operate by projecting light from an LED or a laser onto the printed barcode, and then detecting the level of reflected light as the light beam sweeps across the barcode. Using this technique, the barcode scanner is able to distinguish between dark areas and light areas on the barcode. More light is reflected from the light areas on the barcode than the dark areas, so the optical energy reflected back to the barcode scanner will be a signal containing a series of peaks corresponding to the light areas and valleys corresponding to the dark areas. A processor converts the received optical signal into an electrical signal. The processor decodes the peaks and valleys of the signal to decode the information (e.g., product number) represented by the code symbol.

Typically, barcode scanners have been designed to read barcodes in the near range (e.g., barcodes located less than about three feet from the barcode scanner). Recently, advancements have been made in developing barcode scanners capable of reading barcodes in the far range (e.g., barcodes located about 30 feet or more from the barcode scanner). Attempting to gather readings from a barcode located at these greater distances from the barcode scanner presents significant challenges. In particular, the further away that the barcode is from the barcode scanner, the weaker the return laser light signal will be at the time of signal detection at the photodetector. For barcode scanners having a substantially large scanning range (e.g., working range), in particular, this potentially dramatic variation in signal intensity strength at the photodetector places great demands on the electronic signal processing circuitry, and its ability to deliver sufficient signal-to-noise ratio (SNR) performance over broad dynamic ranges of input signal operation.

Consequently, great efforts have been made over the past few decades to provide laser scanning type barcode scanners, in particular, with automatic gain control (AGC) capabilities that aim to control the gain of the various analog scan data signal processing stages, regardless of input laser return signal strength. In general, feedback control is implemented in the analog domain, and the gain of an amplified stage is adjusted according to a controller. The controller could be, but is not limited to, proportional control, PID control or fuzzy logic control, etc. Also, the amplifier refers to, but is not limited to preamplifier or gain stages along the signal path.

The ability of these techniques of applying gain control to the received signal to achieve greater dynamic range is limited, for example, by the existence of laser noise. Increasing the gain of the received signal also results in proportional increases to signal noise (e.g., laser noise), which can significantly interfere with the ability to decode the scanned barcode.

Therefore, a need exists for a system for reading code symbols in a scanning field that increases the strength of the signal received by the photodetector without resulting in an increase in the strength of signal noise, thereby reducing the overall signal-to-noise ratio of the signal.

SUMMARY OF THE INVENTION

In one aspect, the present disclosure embraces a system for reading code symbols in a laser scanning field. The system includes a laser scanning module for scanning a laser beam across a laser scanning field. The laser scanning module includes a laser source. A photodetector detects the intensity of the light reflected from the laser scanning field and generates a first signal corresponding to the detected light intensity. A source power control module controls the supply of power to the laser source in response to the first signal. Typically, the source power control module controls the power to maintain the intensity of the light reflected from the laser scanning field within a predetermined intensity range.

In an exemplary embodiment, the source power control module is an automatic gain control circuit. In another exemplary embodiment, the source power control module is a microprocessor. In another exemplary embodiment of the system, the source power control module controls the gain of the first signal. Typically, the source power control module controls the gain of the first signal to maintain the first signal's amplitude within a predetermined amplitude range.

In another aspect, the disclosure embraces a method for reading code symbols at long range. Power is supplied to a laser source to generate a laser beam. The laser beam is scanned across a laser scanning field. The intensity of the light reflected from the laser scanning field is detected. A first signal is generated that corresponds to the detected intensity of light reflected from the scanning field. The power supply is controlled in response to the first signal.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of an exemplary embodiment of a code symbol reading system according to the present invention.

FIG. **2** is a schematic block diagram describing the major system components of an exemplary code symbol reading system according to the present invention.

FIG. **3** is block diagram depicting the interaction between selected components of an exemplary code symbol reading system according to the present invention.

FIG. **4** is block diagram depicting the interaction between selected components of an exemplary code symbol reading system according to the present invention.

FIG. **5** is block diagram depicting the interaction between selected components of another exemplary code symbol reading system according to the present invention.

DETAILED DESCRIPTION

Referring to the figures in the accompanying drawings, the illustrative embodiments of the code symbol reading system according to the present invention will be described in great detail, where like elements will be indicated using like reference numerals. Turning now to the drawings, FIGS. **1** and **2** depict an exemplary code symbol reading system according to the present invention. The code symbol reading system **100** has a housing **102** having a head portion and a handle portion supporting the head portion. A light transmission window **103** is integrated with the head portion of the housing **102**. A trigger switch **104** is integrated with the handle portion of the housing **102**. The trigger switch **104** is for generating a trigger event signal to activate a scanning module **105**. The scanning module **105** repeatedly scans across its scanning field **115** a light beam (e.g., a visible laser beam) generated by light source **112** (e.g., a laser source). The laser source **112** has optics to produce a laser scanning beam focused in the scanning field **115** in response to control signals generated by a controller **150**. The scanning module **105** also includes a laser driver **151** for receiving control signals from the controller **150**, and in response thereto, generating and delivering laser (diode) drive current signals to the laser source **112**. A start of scan/end of scan (SOS/EOS) detector **109** generates timing signals indicating the start of a laser beam sweep and the end of a laser beam sweep, and sends those timing signals to the controller **150** and a decode processor **108**. Light collection optics collect light that has been reflected or scattered from a scanned object in the scanning field **115**, and a photodetector **106** detects the intensity of the collected light. The photodetector **106** generates an analog scan data signal (e.g., a first signal) corresponding to the detected light intensity during scanning operations. An analog scan data signal processor/digitizer **107** processes the analog scan data signals and converts the processed analog scan data signals into digital scan data signals (e.g., a second signal). The digital scan data signals are converted into digital words representative of the relative width of the bars and spaces in the scanned code symbol. The digital words are transmitted to a decode processor **108** via lines **142**. The decode processor **108** generates symbol character data representative of each code symbol scanned by the laser beam. An input/output (IO) communication interface module **140** interfaces with a host device **154**. It is through this IO communication module **140** that the symbol character data is transmitted to the host device **154**, which transmission may be done through wired (e.g., USB, RS-232) or wireless (e.g., Bluetooth) communication links **155** between the code symbol reading system **100** and the host device **154**.

The controller **150** generates control signals to control operations within the code symbol reading system **100**. The controller **150** includes a source power control module **160**. The source power control module **160** is adapted to, under certain conditions, direct the laser driver **151** to adjust the power or intensity of the laser beam generated by the laser source **112**.

The laser scanning module **105** includes several subcomponents. A laser scanning assembly **110** has an electromagnetic coil **128** and rotatable scanning element (e.g., mirror) **134** supporting a lightweight reflective element (e.g., mirror) **134**A. A coil drive circuit **111** generates an electrical drive symbol to drive the electromagnetic coil **128** in the laser scanning assembly **110**. The laser source **112** generates a visible laser beam **113**. A beam deflecting mirror **114** deflects the laser beam **113** as an incident beam **114**A towards the mirror component of the laser scanning assembly **110**, which sweeps the deflected laser beam **114**B across the laser scanning field **115** containing a code symbol **16** (e.g., barcode).

As shown in FIG. **2**, the laser scanning module **105** is typically mounted on an optical bench, printed circuit (PC) board or other surface where the laser scanning assembly is also, and includes a coil support portion **110** for supporting the electromagnetic coil **128** (in the vicinity of the permanent magnet **135**) and which is driven by a scanner drive circuit **111** so that it generates magnetic forces on opposite poles of the permanent magnet **135**, during scanning assembly operation. Assuming the properties of the permanent magnet **135** are substantially constant, as well as the distance between the permanent magnet **135** and the electromagnetic coil **128**, the force exerted on the permanent magnet **135** and its associated scanning element is a function of the electrical drive current $I_{DC}(t)$ supplied to the electromagnetic coil **128** during scanning operations. In general, the greater the level of drive current $I_{DC}(t)$ produced by scanner drive circuit **111**, the greater the forces exerted on permanent magnet **135** and its associated scanning element. Thus, scan sweep angle $\alpha(t)$ of the scanning module **105** can be directly controlled by controlling the level of drive current $I_{DC}(t)$ supplied to the coil **128** by the scanner drive circuit **111** under the control of controller **150**, shown in FIG. **2**.

In response to the manual actuation of trigger switch **104**, the laser scanning module **105** generates and projects a laser scanning beam through the light transmission window **103**, and across the laser scanning field **115** external to the housing **102**, for scanning an object in the scanning field **115**. The laser scanning beam is generated by the laser source **112** in response to control signals generated by the controller **150**. The scanning element (i.e., mechanism) **134** repeatedly scans the laser beam across the object in the laser scanning field at the constant scan sweep angle $\alpha(t)$ set by the controller **150** during scanning operation. Then, the light collection optics **106** collect light reflected/scattered from scanned code symbols on the object in the scanning field, and the photo-detector **106** automatically detects the intensity of collected light (i.e., photonic energy) and generates an analog scan data signal (e.g., a first signal) corresponding to the light intensity detected during scanning operations.

Typically, when the object bearing the code symbol **16** is in the near field of the code symbol reading system's **100** working distance (e.g., when the code symbol **16** is less than about seventeen feet from the code symbol reading system **100**) the intensity of the collected light (e.g., the laser beam reflected off the code symbol **16**) will be adequate to allow the system **100** to decode (e.g., read) the code symbol **16**. When the code symbol **16** is at the far range (e.g., greater than about seventeen feet from the system **100**) of the working area, the intensity of the collected light can be significantly reduced from intensity levels in the near range (e.g., 1600 times less than intensity levels in the near range). The resulting analog scan data signal corresponding to the light intensity is often too weak to be decoded by the system **100**. The practical result is that the user of the system **100** attempting to scan code symbols **16** in or near the far range often encounters significant read delays or misreads.

As shown in FIGS. **3** through **5**, to combat this problem, the source power control module **160** monitors the analog scan digital signal corresponding to the detected light intensity. When the intensity of the reflected laser beam drops below a predefined intensity level, the source power control module **160** causes the laser source **112** to increase the power of its emitted laser beam. As a result of the increased power, the intensity of the reflected light is also increased. The source power control module **160** continues to cause the laser source **112** to increase the intensity of its emitted laser beam until the source power control module **160** detects that the reflected laser beam's intensity is above the level of the predefined threshold.

The source power control module **160** may similarly be adapted to decrease the intensity of the laser beam emitted by the laser source **112**. This may be advantageous in that it allows for reduced power use by the laser source **112**, thereby decreasing heat output and degradation of the laser source **112**.

The source power control module **160** may comprise an automatic gain control circuit **160**A or a microprocessor **160**B configured to regulate the reflected laser beam's intensity within a predefined intensity range.

As shown in FIGS. **4** and **5**, the source power control module **160** may combine the novel technique of adjusting the power of the laser source **112** with the technique of adjusting the gain of the first signal (i.e., adjusting the first signal after processing by the photodetector **106**). Typically, the first signal's gain is adjusted via an analog gain control circuit **160**A, though it may be adjusted through a microprocessor **160**B. Gain adjustments may be made at various stages of the processing of the first signal, including during processing by the analog scan data processor **107** or during amplifier stages **170**. This novel approach of adjusting the signal on both the emitting side and the receiving side of the code symbol reading system **100** allows the two techniques to complement each other, potentially resulting in greatly improved performance. By combining power control techniques with gain control techniques, the maximum dynamic range of the system **100** can be greatly improved. For example, if the dynamic range using gain control is M:1, and the dynamic range using power control is N:1, then the maximal dynamic range resulting from employment of both techniques could be (M*N):1.

The foregoing exemplary embodiments typically refer to a 1-D barcode but may be used to scan and read other symbols, such as 2-D barcodes, 2-D stacked linear barcodes, and 2D matrix codes. As used herein, the term "code symbol" includes such symbols and any symbol used to store information.

To supplement the present disclosure, this application incorporates entirely by reference the following patents, patent application publications, and patent applications: U.S. Pat. No. 6,832,725; U.S. Pat. No. 7,159,783; U.S. Pat. No. 7,413,127; U.S. Pat. No. 8,390,909; U.S. Pat. No. 8,294,969; U.S. Pat. No. 8,408,469; U.S. Pat. No. 8,408,468; U.S. Pat. No. 8,381,979; U.S. Pat. No. 8,408,464; U.S. Pat. No. 8,317,105; U.S. Pat. No. 8,366,005; U.S. Pat. No. 8,424,768; U.S. Pat. No. 8,322,622; U.S. Pat. No. 8,371,507; U.S. Pat. No. 8,376,233; U.S. Pat. No. 8,457,013; U.S. Pat. No. 8,448,863; U.S. Pat. No. 8,459,557; U.S. Patent Application Publication No. 2012/0111946; U.S. Patent Application Publication No. 2012/0223141; U.S. Patent Application Publication No. 2012/0193423; U.S. Patent Application Publication No. 2012/0203647; U.S. Patent Application Publication No. 2012/0248188; U.S. Patent Application Publication No. 2012/0228382; U.S. Patent Application Publication No. 2012/0193407; U.S. Patent Application Publication No. 2012/0168511; U.S. Patent Application Publication No. 2012/0168512; U.S. Patent Application Publication No. 2010/0177749; U.S. Patent Application Publication No. 2010/0177080; U.S. Patent Application Publication No. 2010/0177707; U.S. Patent Application Publication No. 2010/0177076; U.S. Patent Application Publication No. 2009/0134221; U.S. Patent Application Publication No. 2012/0318869; U.S. Patent Application Publication No. 2013/0043312; U.S. Patent Application Publication No. 2013/0068840; U.S. Patent Application Publication No. 2013/0070322; U.S. Patent Application Publication No. 2013/0075168; U.S. Patent Application Publication No. 2013/0056285; U.S. Patent Application Publication No.

2013/0075464; U.S. Patent Application Publication No. 2013/0082104; U.S. Patent Application Publication No. 2010/0225757; U.S. patent application Ser. No. 13/347,219 for an OMNIDIRECTIONAL LASER SCANNING BAR CODE SYMBOL READER GENERATING A LASER SCANNING PATTERN WITH A HIGHLY NON-UNIFORM SCAN DENSITY WITH RESPECT TO LINE ORIENTATION, filed Jan. 10, 2012 (Good); U.S. patent application Ser. No. 13/347,193 for a HYBRID-TYPE BIOPTICAL LASER SCANNING AND DIGITAL IMAGING SYSTEM EMPLOYING DIGITAL IMAGER WITH FIELD OF VIEW OVERLAPPING FIELD OF FIELD OF LASER SCANNING SUBSYSTEM, filed Jan. 10, 2012 (Kearney et al.); U.S. patent application Ser. No. 13/367,047 for LASER SCANNING MODULES EMBODYING SILICONE SCAN ELEMENT WITH TORSIONAL HINGES, filed Feb. 6, 2012 (Feng et al.); U.S. patent application Ser. No. 13/400,748 for a LASER SCANNING BAR CODE SYMBOL READING SYSTEM HAVING INTELLIGENT SCAN SWEEP ANGLE ADJUSTMENT CAPABILITIES OVER THE WORKING RANGE OF THE SYSTEM FOR OPTIMIZED BAR CODE SYMBOL READING PERFORMANCE, filed Feb. 21, 2012 (Wilz); U.S. patent application Ser. No. 13/432,197 for a LASER SCANNING SYSTEM USING LASER BEAM SOURCES FOR PRODUCING LONG AND SHORT WAVELENGTHS IN COMBINATION WITH BEAM-WAIST EXTENDING OPTICS TO EXTEND THE DEPTH OF FIELD THEREOF WHILE RESOLVING HIGH RESOLUTION BAR CODE SYMBOLS HAVING MINIMUM CODE ELEMENT WIDTHS, filed Mar. 28, 2012 (Havens et al.); U.S. patent application Ser. No. 13/492,883 for a LASER SCANNING MODULE WITH ROTATABLY ADJUSTABLE LASER SCANNING ASSEMBLY, filed Jun. 10, 2012 (Hennick et al.); U.S. patent application Ser. No. 13/367,978 for a LASER SCANNING MODULE EMPLOYING AN ELASTOMERIC U-HINGE BASED LASER SCANNING ASSEMBLY, filed Feb. 7, 2012 (Feng et al.); U.S. patent application Ser. No. 13/852,097 for a System and Method for Capturing and Preserving Vehicle Event Data, filed Mar. 28, 2013 (Barker et al.); U.S. patent application Ser. No. 13/780,356 for a Mobile Device Having Object-Identification Interface, filed Feb. 28, 2013 (Samek et al.); U.S. patent application Ser. No. 13/780,158 for a Distraction Avoidance System, filed Feb. 28, 2013 (Sauerwein); U.S. patent application Ser. No. 13/784,933 for an Integrated Dimensioning and Weighing System, filed Mar. 5, 2013 (McCloskey et al.); U.S. patent application Ser. No. 13/785,177 for a Dimensioning System, filed Mar. 5, 2013 (McCloskey et al.); U.S. patent application Ser. No. 13/780,196 for Android Bound Service Camera Initialization, filed Feb. 28, 2013 (Todeschini et al.); U.S. patent application Ser. No. 13/792,322 for a Replaceable Connector, filed Mar. 11, 2013 (Skvoretz); U.S. patent application Ser. No. 13/780,271 for a Vehicle Computer System with Transparent Display, filed Feb. 28, 2013 (Fitch et al.); U.S. patent application Ser. No. 13/736,139 for an Electronic Device Enclosure, filed Jan. 8, 2013 (Chaney); U.S. patent application Ser. No. 13/771,508 for an Optical Redirection Adapter, filed Feb. 20, 2013 (Anderson); U.S. patent application Ser. No. 13/750,304 for Measuring Object Dimensions Using Mobile Computer, filed Jan. 25, 2013; U.S. patent application Ser. No. 13/471,973 for Terminals and Methods for Dimensioning Objects, filed May 15, 2012; U.S. patent application Ser. No. 13/895,846 for a Method of Programming a Symbol Reading System, filed Apr. 10, 2013 (Corcoran); U.S. patent application Ser. No. 13/867,386 for a Point of Sale (POS) Based Checkout System Supporting a Customer-Transparent Two-Factor Authentication Process During Product Checkout Operations, filed Apr. 22, 2013 (Cunningham et al.); U.S. patent application Ser. No. 13/888,884 for an Indicia Reading System Employing Digital Gain Control, filed May 7, 2013 (Xian et al.); U.S. patent application Ser. No. 13/895,616 for a Laser Scanning Code Symbol Reading System Employing Multi-Channel Scan Data Signal Processing with Synchronized Digital Gain Control (SDGC) for Full Range Scanning, filed May 16, 2013 (Xian et al.); U.S. patent application Ser. No. 13/897,512 for a Laser Scanning Code Symbol Reading System Providing Improved Control over the Length and Intensity Characteristics of a Laser Scan Line Projected Therefrom Using Laser Source Blanking Control, filed May 20, 2013 (Brady et al.); U.S. patent application Ser. No. 13/897,634 for a Laser Scanning Code Symbol Reading System Employing Programmable Decode Time-Window Filtering, filed May 20, 2013 (Wilz, Sr. et al.); U.S. patent application Ser. No. 13/902,242 for a System For Providing A Continuous Communication Link With A Symbol Reading Device, filed May 24, 2013 (Smith et al.); U.S. patent application Ser. No. 13/902,144, for a System and Method for Display of Information Using a Vehicle-Mount Computer, filed May 24, 2013 (Chamberlin); U.S. patent application Ser. No. 13/902,110 for a System and Method for Display of Information Using a Vehicle-Mount Computer, filed May 24, 2013 (Hollifield); and U.S. patent application Ser. No. 13/912,262 for a Method of Error Correction for 3D Imaging Device, filed Jun. 7, 2013 (Jovanovski et al.).

In the specification and figures, typical embodiments of the invention have been disclosed. The present invention is not limited to such exemplary embodiments. Unless otherwise noted, specific terms have been used in a generic and descriptive sense and not for purposes of limitation.

The invention claimed is:

1. A system for reading code symbols in a laser scanning field, comprising:
- a laser scanning module for scanning a laser beam across a laser scanning field, the laser scanning module comprising a laser source;
- a photodetector for detecting the intensity of light reflected from the laser scanning field and generating a first signal corresponding to the detected light intensity; and
- a source power control module for:
  - controlling the power supplied to the laser source in response to the first signal; and
  - controlling a gain of the first signal;
- wherein the system's dynamic range controlling only the power supplied to the laser source is N:1;
- wherein the system's dynamic range controlling only the gain of the first signal is M:1; and
- wherein the system's dynamic range controlling both the power supplied to the laser source and the gain of the first signal is (M*N):1.

2. The system of claim **1**, wherein the source power control module controls the power to maintain the intensity of the light reflected from the laser scanning field within a predetermined intensity range.

3. The system of claim **1**, wherein the source power control module comprises an automatic gain control circuit.

4. The system of claim **1**, wherein the source power control module comprises a microprocessor.

5. The system of claim **1**, wherein the source power control module controls the gain of the first signal to maintain the first signal's amplitude within a predetermined amplitude range.

6. A method for reading code symbols, comprising:
- supplying power to a laser source to generate a laser beam having a dynamic range of N:1;
- scanning the laser beam across a laser scanning field;
- detecting the intensity of light reflected from the laser scanning field;
- generating a first signal corresponding to the detected intensity of light reflected from the laser scanning field;
- amplifying the first signal according to a gain to achieve a dynamic range of M:1;
- controlling, in response to the first signal, the power supplied to the laser source and the gain amplifying the first signal to achieve a dynamic range of (M*N):1.

7. The method of claim **6**, comprising controlling the power supplied to the laser source to maintain the intensity of the light reflected from the laser scanning field within a predetermined intensity range.

8. The method of claim **6**, comprising controlling the power supplied to the laser source via an automatic gain control circuit.

9. The method of claim **6**, comprising controlling the power supplied to the laser source via a microprocessor.

10. The method of claim **6**, comprising controlling the gain of the first signal.

11. The method of claim **6**, comprising controlling the gain of the first signal to maintain the first signal's amplitude within a predetermined amplitude range.

12. The method of claim **6**, comprising:
- controlling the power supplied to the laser source via a source power control module; and
- controlling the gain of the first signal via the source power control module.

13. The method of claim **6**, comprising:
- controlling the power supplied to the laser source via a source power control module to maintain the intensity of the light reflected from the laser scanning field within a predetermined intensity range; and
- controlling the gain of the first signal via the source power control module to maintain the first signal's amplitude within a predetermined amplitude range.

14. A method for reading code symbols, comprising:
- supplying power to a laser source to generate a laser beam having a dynamic range of N:1;
- scanning the laser beam across a laser scanning field;
- detecting the intensity of light reflected from the laser scanning field;
- generating a first signal corresponding to the detected intensity of light reflected from the laser scanning field;
- amplifying the first signal according to a and gain to achieve a dynamic range of M:1; and
- controlling, in response to the amplified first signal, the power supplied to the laser source and the gain amplifying the first signal to achieve a dynamic range of (M*N):1.

15. The method of claim **14**, comprising controlling the power supplied to the laser source to maintain the intensity of the light reflected from the laser scanning field within a predetermined intensity range.

16. The method of claim **14**, comprising controlling the power supplied to the laser source via an automatic gain control circuit.

17. The method of claim **14**, comprising controlling the power supplied to the laser source via a microprocessor.

18. The method of claim **14**, comprising:
- controlling the power supplied to the laser source via a source power control module; and
- controlling the gain at which the first signal is amplified via the source power control module.

19. The method of claim **14**, comprising:

controlling the power supplied to the laser source via a source power control module to maintain the intensity of the light reflected from the laser scanning field within a predetermined intensity range; and

controlling the gain at which the first signal is amplified via the source power control module to maintain the first signal's amplitude within a predetermined amplitude range.

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